

## **Irradiation of Grain for Quarantine Purposes: Aspects of Radiation-Induced Perturbation of Mycotoxin Production**

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As a substitute for methyl bromide fumigation of grain to satisfy quarantine requirements, irradiation has many obvious advantages over alternative technologies. Irradiation can conveniently be done on-line with throughput capacities able to accommodate the needs of even very large grain handling facilities. Effectiveness of the process, in terms of insect disinfestation, is not affected by variations in temperature or humidity of the grain. In addition, irradiation is effective against a very broad spectrum of insect species. The process is essentially instantaneous, and does not require prolonged exposure to assure disinfestation, or subsequently, to aerate the grain to remove residual gas. Quality attributes of grain and flour remain unchanged at doses required for disinfestation. In addition, treatment costs for irradiation can be very low, for throughputs characteristic of modern export terminals for grain.

A potential concern stems from several published reports which indicate that under some conditions production of mycotoxins in irradiated grains may be enhanced relative to that in unirradiated control. If practically significant, this phenomenon could be a serious obstacle to adoption of the irradiation option. Our laboratory has carried out a variety of studies of this phenomenon, to characterize the effects of irradiation on mycotoxin production in grains. In particular, production of ochratoxin A in barley, and of aflatoxin in rice, have been examined. Results of these studies demonstrate that the radiation-induced perturbations of mycotoxin production appear to be identical to perturbations induced by treatment with common fumigants, including methyl bromide and phosphine. This comparison demonstrates that mycotoxin production in irradiated grain would be similarly affected as infumigated grain. Fumigation has been used for decades in the grain industry, without any evidence that it effects enhanced production of mycotoxins. From this it follows that the potential risk of enhanced production of mycotoxins in irradiated grain is insignificant and should not be a significant barrier to implementation of irradiation as a quarantine treatment.